second supplement continues the literature of 1899–1904 in reference to dicotyledons from Euphorbiaceae to Sapotaceae.—J. M. C.

Flora of Winneshiek Co., Iowa.—SHIMEK[7] has published an account of the plants of one of the counties of Iowa, prefacing the annotated list by a discussion of the forest problem, ornamental plants, forage plants, weeds, and medicinal plants.—J. M. C.

Eucalyptus.—The eighth part of MAIDEN'S[8] revision of Eucalyptus contains the description, synonymy, range, and affinities of seven species. This series, begun in 1903, now includes twenty-four species.—J. M. C.

Das Pflanzenreich.[9]—Part 28 contains the group Calceolarieae of Scrophulariaceae. The three genera are Porodittia (1 sp.), Jovellana (6 spp.), and Calceolaria (192 spp., with 9 new).—J. M. C.

NOTES FOR STUDENTS

Apogamy and apospory in ferns.—Professor FARMER and Miss DIGBY have published[10] the results of their studies of apogamy and apospory in ferns. The forms described are *Lastrea pseudo-mas* vars. *polydactyla* Wills, *polydactyla* Dadds, and *cristata apospora* Druery; *Athyrium Filix-foemina* vars. *clarissima* Jones, *clarissima* Bolton, and *uncoglomeratum* Stansfield; and *Scolopendrium vulgare* var. *crispum Drummondae.*

In *Athyrium Filix-foemina clarissima* Jones there is no change in the number of chromosomes in passing from the sporophyte to the gametophyte phase of the life-history; and there is no migration of nuclei from one prothallial cell to another. The embryo arises as a bud upon the gametophyte.

In *Athyrium Filix-foemina clarissima* Bolton there is no reduction of chromosomes, no true fertilization, no migration of prothallial nuclei, and the embryo develops from an unfertilized egg.

In *Athyrium Filix-foemina uncoglomeratum* Stansfield the embryo arises in connection with an archegonium, but details were not discovered. The number of chromosomes (about 100) is maintained throughout the life-history and there is no migration of prothallial nuclei.

In *Scolopendrium vulgare crispum Drummondae* a remarkable condition is described. The number of chromosomes in sporophyte nuclei is about 100, in prothallial nuclei about 70, in archegonial nuclei about 80, and in antheridial

---

7 SHIMEK, B., Flora of Winneshiek County. Iowa Geol. Surv. **16**:147–211. 1906.

8 MAIDEN, J. H., A critical revision of the genus Eucalyptus. Part VIII. pp. 211–254. *pls. 37–40.* Sydney: Published by State of New South Wales. 1907. *2s. 6d.*

9 ENGLER, A., Das Pflanzenreich. Heft 28. Scrophulariaceae Antirrhinoideae-Calceolarieae von Fr. Kränzlin. pp. 128. *figs. 21 (142).* Leipzig: Wilhelm Engelmann. 1907. *M*6.40.

10 FARMER, J. BRETLAND, and L. DIGBY, Studies in apogamy and apospory in ferns. Annals of Botany **21**:161–199. *pls. 16–20.* 1907.

nuclei between 70 and 82. There is no cyclic alteration in the number of chromosomes, and no migration or fusion of nuclei of prothallial cells. The embryo arises from the unfertilized egg.

In *Lastrea pseudo-mas polydactyla* Wills, the authors still maintain their claim, made in a preliminary paper, that there is a migration and fusion of prothallial nuclei, thus initiating the sporophytic phase. There is a normal reduction of chromosomes.

In *Lastrea pseudo-mas polydactyla* Dadds there is a reduction of chromosomes and the sporophyte is initiated by a migration and fusion of prothallial nuclei. The embryo, however, comes from a projection which may be regarded as an arrested archegonium.

In *Lastrea pseudo-mas cristata apospora* Druery there is no reduction of chromosomes and no migration of prothallial nuclei. The number of chromosomes shows a remarkable variation, there being 60 in nuclei of prothallial cells, about 78 in nuclei of the embryo, and about 90 in nuclei of antherozoids.

These various forms may be arranged in two categories, one in which spores are produced in connection with the usual reduction of chromosomes; and the other in which there is no spore formation or reduction of chromosomes, the embryo appearing as an outgrowth from the sporophyte. The wide variation in the number of chromosomes is not thought to be due to inaccuracy in counting, but to a real difference. The authors believe that the fluctuation might seem to negative any value being attached to the number of chromosomes.

After a lengthy discussion a general conclusion is drawn which is quite at variance with current notions, namely that there is no necessary correlation between the periodic reduction in the number of chromosomes and alternation of generations. Fertilization and reduction, however, are recognized as holding a definite causal relation to each other, but without assuming any necessary connection between either of them and any other features in the life-history.—CHARLES J. CHAMBERLAIN.

Apogamy in Marsilia.—While investigating apogamy in Alchemilla, STRASBURGER[11] realized the desirability of examining apogamy in other groups. Since Marsilia had been reported to produce embryos without fertilization, he secured material from various botanists, and even obtained sporocarps from specimens in the Kew and Berlin herbaria. Some of the sporocarps, known to have been collected more than thirty years ago, germinated readily.

In some species, notably *M. Drummondii*, the megaspores when isolated from microspores produce prothallia and embryos almost as abundantly as when microspores are present. Sections show that embryos often develop from eggs without fertilization, and that nuclei of these embryos have 32 chromosomes, the $2x$, diploid, or sporophyte number, as was found by comparing mitoses in root tips and other vegetative structures. Megaspores are formed which have $2x$ chromosomes in their nuclei, the reduction of chromosomes having failed to take

[11] STRASBURGER, E., Apogamy bei Marsilia. Flora **97**:123–191. *pls. 3–8.* 1907.